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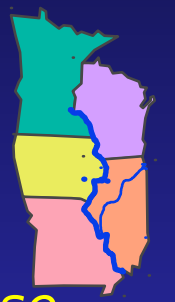
Briefing for



Navigation lock and dam inspection and emergency response workshop

Standardization of Lock Design: UMR-IWW Navigation and Ecosystem Sustainability Program (NESP)

April 18, 2006

by

Jeff Stamper, P.E.

Technical manager for Navigation

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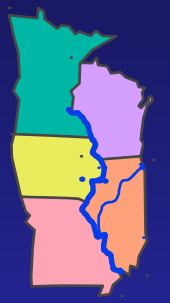
Topics



1. Workshop Theme Questions – things to think about
2. Brief Intro to NESP
3. NESP Navigation Locks Focus
4. Standardization Tools

Workshop Theme Questions

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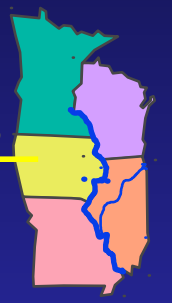

1. Are today's projects/mechanisms tomorrow's repairs? In the Highlight Zone are:
   - Precast concrete stay-in-place forms, in the wet, P/T, varying mix designs and their properties, setting piles and locked-in loads, bearing transfer to piles, sight unseen inspections.
2. How can we make future repairs and troubleshooting easier?

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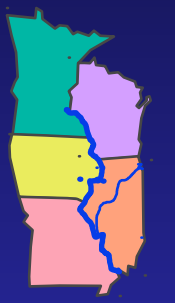
Future Problem Solving Considerations



- We have less institutional knowledge on in-the-wet construction techniques
- Standardization of design/constr can reduce variability of problems
- Smart infrastructure – performance monitoring, wireless sensor networks, data collection-storage-analysis.

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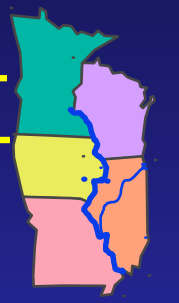
Future Problem Solving Considerations



- Centralized knowledge centers/databases will be key. CoPs a good start, but too reliant on people that get promoted, retire, forget, go on vacation, deploy, etc.
- Documentation is key – design documents, instr to field, inspection logs, constr files, As-builts, technologically survivable data, etc.

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Lack of Documentation is a Universal Problem

- Voted overwhelmingly in QC Class – NWW, FAA, MVS, SAD, LRL, LRH, Bases
- Drawings normally can be found so if it is important put it on drawings. Specs, constr file, instr to field not around
- Technological Survivability – media, hardware, software, archival, retrieval.
- Projectwise viewed as best solution in sight.

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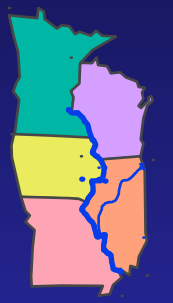
NESP Vision Statement for the UMRS



Long-term sustainability of the economic uses and ecological integrity of the UMRS

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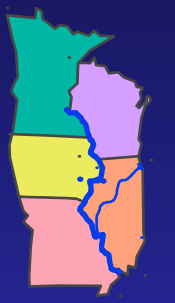
ECOSYSTEM RESTORATION IMPLEMENTATION



$1.6 Billion First Increment

- Fish Passage @ Dams 4,8,22, and 26 ($226M)
- Changes in Water Level Control @ Dams 25 and 16 ($44M)
- Adaptive Implementation of 225 small projects of less than $25 million each ($1B)
  - Island Building
  - Backwater/Side Channel Restoration
  - Wing Dam/Dike Alterations
  - Island Shoreline Protection
- 35,000 Acres of Floodplain Restoration ($299M)
- Continued Study and Monitoring ($11M)

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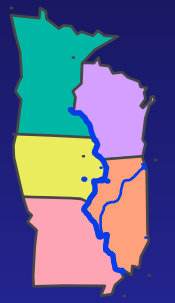
NAVIGATION PROJECTS COSTS

$2 Billion First Increment



1. **Adaptive Management, Economic Models ($16M)**
2. **Mitigation for Incremental Traffic Effects ($183M)**
3. **Develop and Test Nav Appt Scheduling ($0.45M)**
4. **Moorings @ Various Locks ($12M)**
5. **Switchboats @ Locks 20 through 25 ($224M)**
6. **1200’ chambers at Locks 20 - 25, LaGrange, and Peoria, and Site-specific mitigation ($1.6B)**

- **Cost shared with IWWTF after Authorization.**

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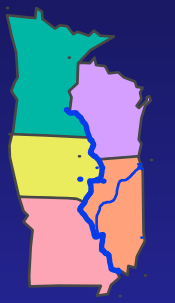
NAVIGATION PROJECTS
FY05 and 06 PED Budgets



- FY05 budget approx $5M
- FY06 budget approx $4.5M
- FY07 budget $0 to $2M President, Congressional add ??
- Project still awaiting authorization

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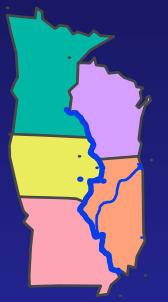
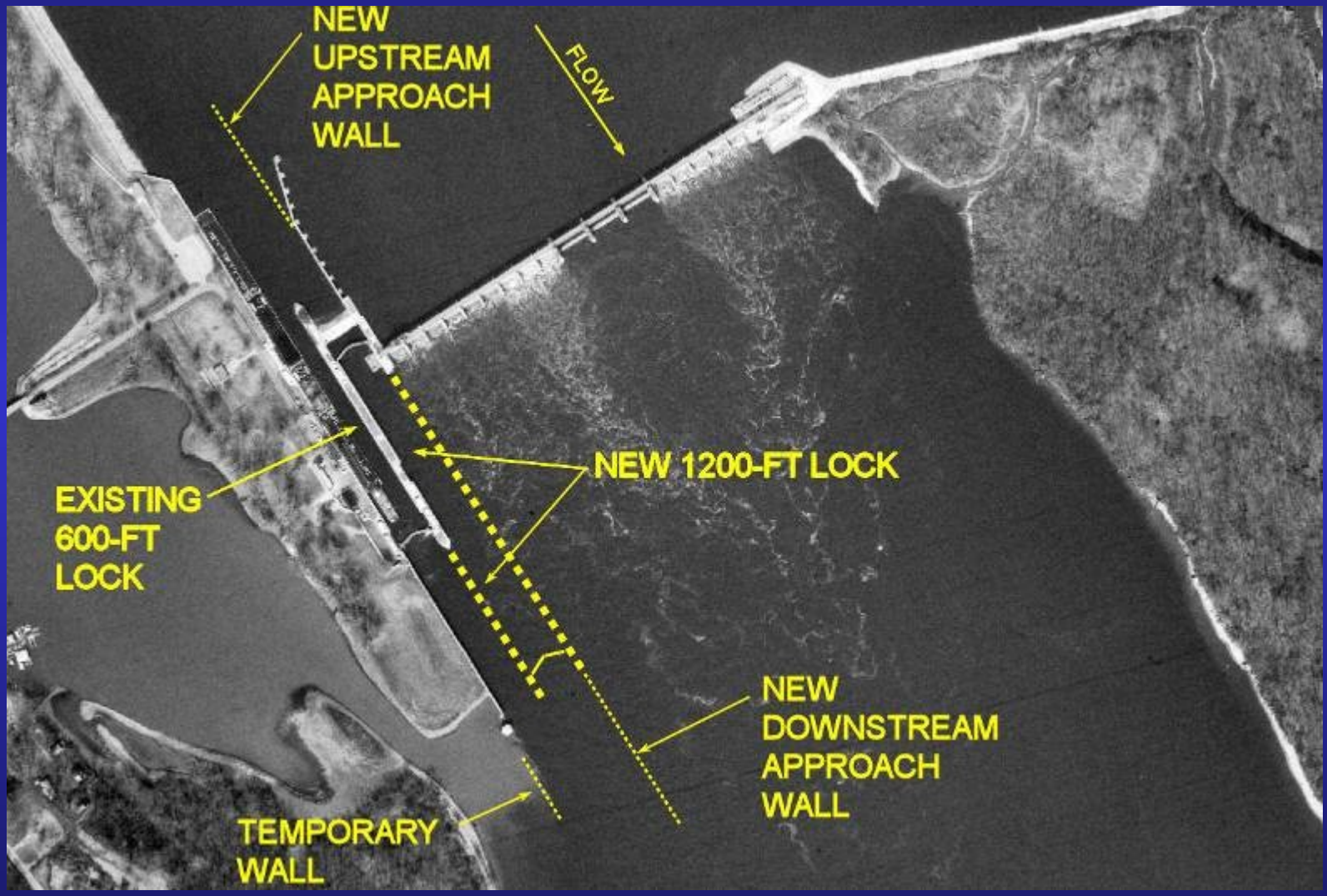
UMR New Locks





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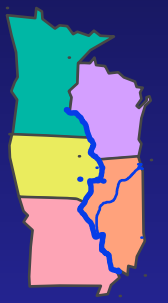
Implementation Timeline for a $240M Lock – 13 years



Design and Construction Timeline and Cost Distribution for a $240M Lock															
Tasks	Cost of Tasks	Fiscal Year													
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Site Specific Design	9.1m														
DDR#1	1m														
P&S#1	3.5m														
EDC, S&A #1	4.6m														
onstruction Phase #1	48.5m														
DDR#2	2.1m														
P&S#2	9.2m														
EDC, S&A #2	12m														
onstruction Phase #2	148m														
ost Distribution (millions)	$240m	1.9	3.6	3.6	3.6	3.6	22	22	33	27	27	27	27	27	12

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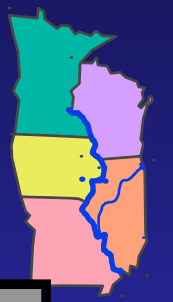
Lock System Plan



Navigation Locks Construction Dates and Costs			
FIRST INCREMENT - $1.6 B			
Locks	Start Constr	Finish Constr	Costs (mill in 2005 prices)
NEW LOCKS on UMR			
Lock 25	2009	2018	264
Lock 22	2009	2017	188
Lock 24	2013	2021	253
Lock 21	2013	2021	262
Lock 20	2015	2023	187
NEW LOCKS on ILLINOIS			
LaGrange	2011	2020	226
Peoria	2016	2025	229

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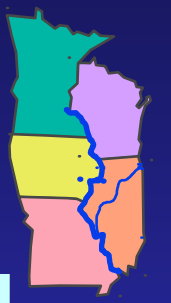
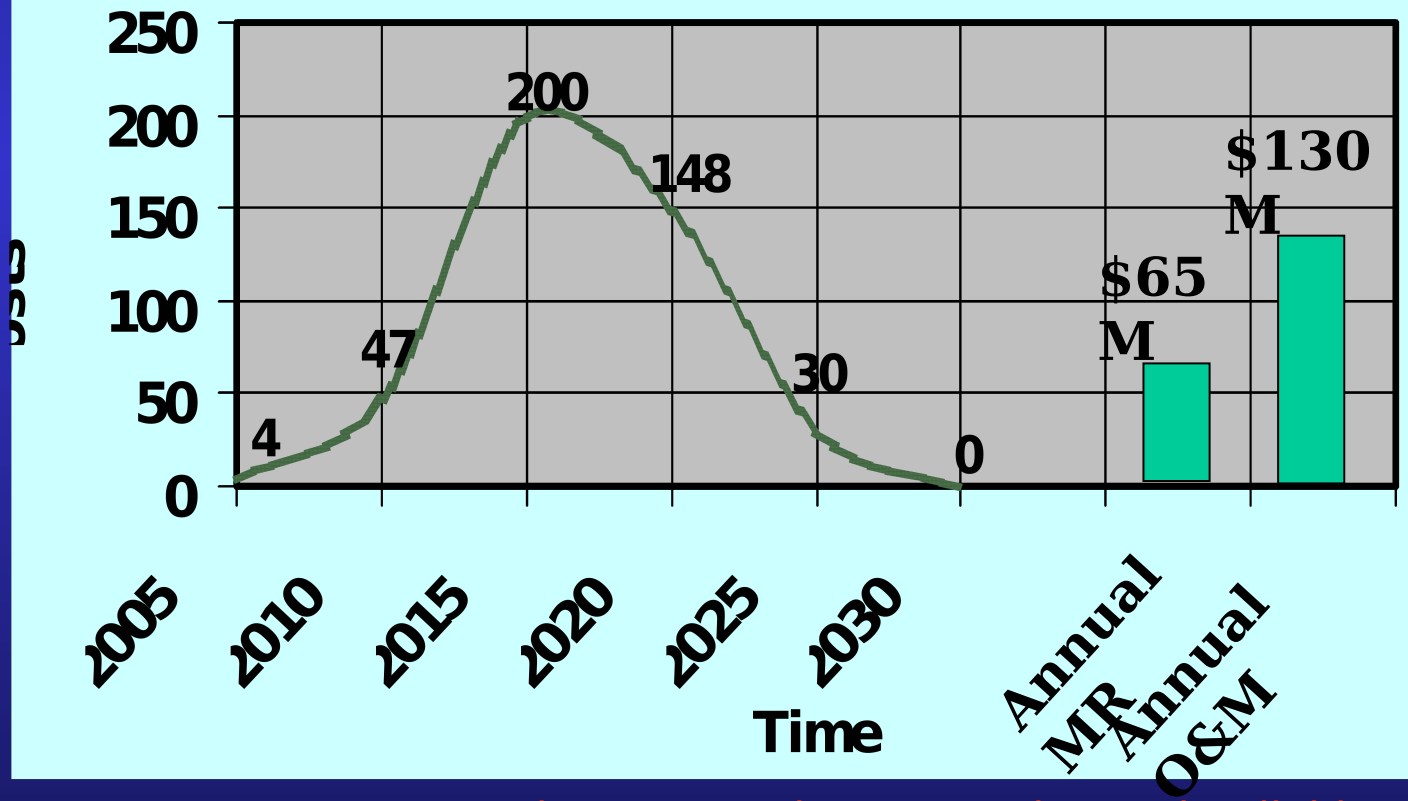
Lock System Plan: Funding Needs



First Increment Navigation Program Costs (2005 Price Level)



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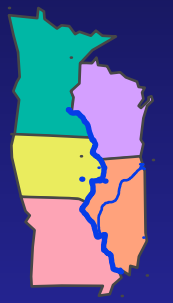

NESP Lock Design

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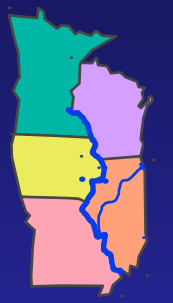
Lock Design Objectives



- Control Costs
- Provide Reliable Service
- Make Lock Maintainable and Repairable
- Standardization of Features
- Provide Navigation Efficiency
- Minimize Impacts to Navigation During Construction
- Ensure Operability
- Learn Lessons and Manage Knowledge

Lock Design Objectives

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Examples:

1. **Reliable Service - Spare miter gate changeout program**
2. **Standardization – System-Compatible Lock Bulkheads, lock features, controls, gates, etc**
3. **Lessons Learned – active outreach effort**
4. **Maintainability – spare operating equipment**

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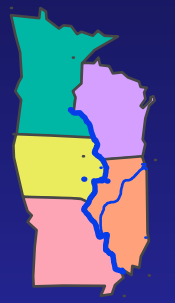
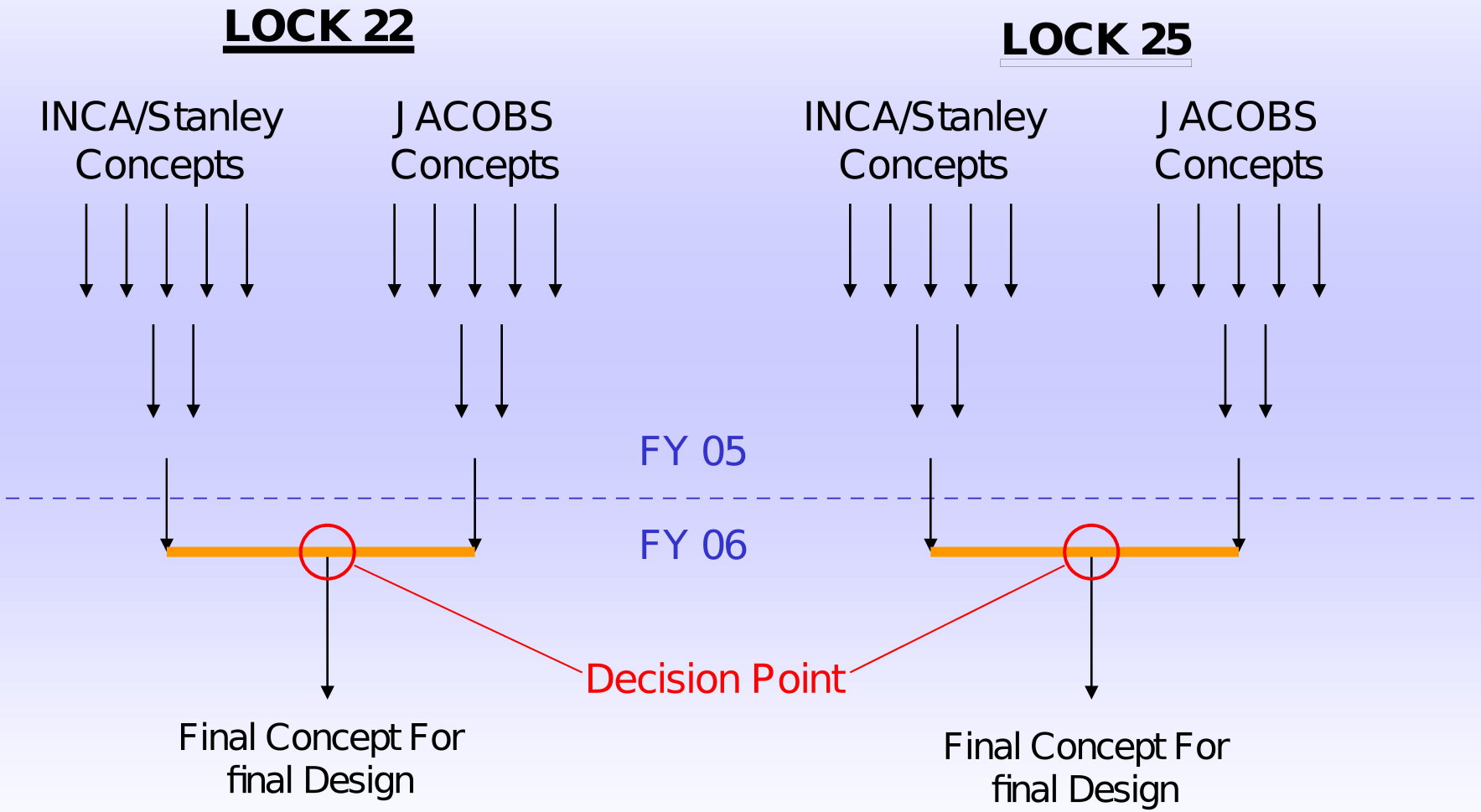
Design PDT and QC Measures



1. **Regional PDT - Regional PDT allows - shared resources, funds, enlarged network, greater base for ideas.**
   - **MVR, MVS, MVP, ERDC, AE firms**
2. **Communities of Practice – awareness and advisory**
   - **H&H, geotech, Nav Economics**
3. **Seemless Independent Technical Review**
   - **LRP, LRL, LRH, MVK, MVP**
4. **Proactively Seek Lessons Learned**
   - **McAlpine, Olmsted, Marmet, Braddock, Charleroi, IHNC, RNDT.**

Standardized Concept Development



Standard Decision Making Criteria Comparison Matrix

Criteria Ranking Matrix — Matrix #1 — Both Sites

Constructability	Bidability	Operability	Maintainability	Construction Cost	Aesthetics	Impact to Navigation	Design	Environmental Concerns	Funding Constraints
A	B	C	D	E	F	G	H	I	J

A	A	2	A	1	A	0	E	1	A	5	G	3	A	2	A	3	A	3	A	16	4	12.6%	Constructa
	B		C	3	D	3	E	1	B	5	G	3	H	1	B	3	B	3	B	11	7	8.7%	Bidability
			C		C	1	E	1	C	5	C	2	C	1	C	3	C	3	C	18	2	14.2%	Operability
					D		D	1	D	5	D	1	D	1	D	3	D	3	D	17	3	13.4%	Maintainab
							E		E	5	G	0	E	2	E	3	E	3	E	16	4	12.6%	Constructi
									F		G	5	H	5	I	5	J	5	F	0	10	0.0%	Aesthetics
											G		G	2	G	4	G	4	G	21	1	16.5%	Impact to N
													H		H	4	H	4	H	14	6	11.0%	Design
															I		I	4	I	9	8	7.1%	Environme
																	J		J	5	9	3.9%	Funding C
																				127		100.00%	

Preference Weighing:
0 - No Difference
1- Minor
2 -
3 - Medium
4 –
5 - Major

A	Constructability
B	Bidability
C	Operability
D	Maintainability
E	Construction Cost
F	Aesthetics
G	Impact to Navigation
H	Design
I	Environmental Concerns
J	Funding Constraints

*(1) first column is which factor has preference

*(2) second is preference weighing

Recalculate

Standard Matrix for Alternative Comparisons

MATRIX #2 SAND Site

Factors/Sub-fa	Global Rank, R	Concept comparison (L/B)	Strengths	Weaknes	Better Concept? (L/B)	Comments	How Much Better, Δ? (0,1-5)	R*Δ
1. Constructability	16	L			L		2	32.00
		B						0.00
2. Bidability	11	L						0.00
		B			B		2	22.00
3. Operability	18	L			L		1	18.00
4. Maintainability	17	L			L		2	34.00
		B						0.00
5. Construction Cost	16	L			L		0	0.00
		B						0.00
6. Aesthetics	0	L			L		2	0.00
		B						0.00
7. Impact to Navigat	21	L			L		3	63.00
		B						0.00
8. Design	14	L			L		1	14.00
		B						0.00
9. Environmental Co	9	L			L		1	9.00
		B						0.00
10. Funding Constra	5	L						0.00
		B			B?			0.00

A=Lift-in Box Alternative

B=Baseline

8 wins for L, 2 for B

TOTAL CONCEPT SCORES

Possible Showstoppers

Environmental concerns

Transition between original lock and new lock

Existing infrastructure conditions

Lift-In Box Alternative	**160.00**
Baseline	**22.00**

Lock Design Concept: Locks 20 thru 25

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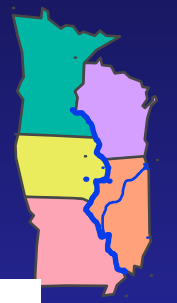

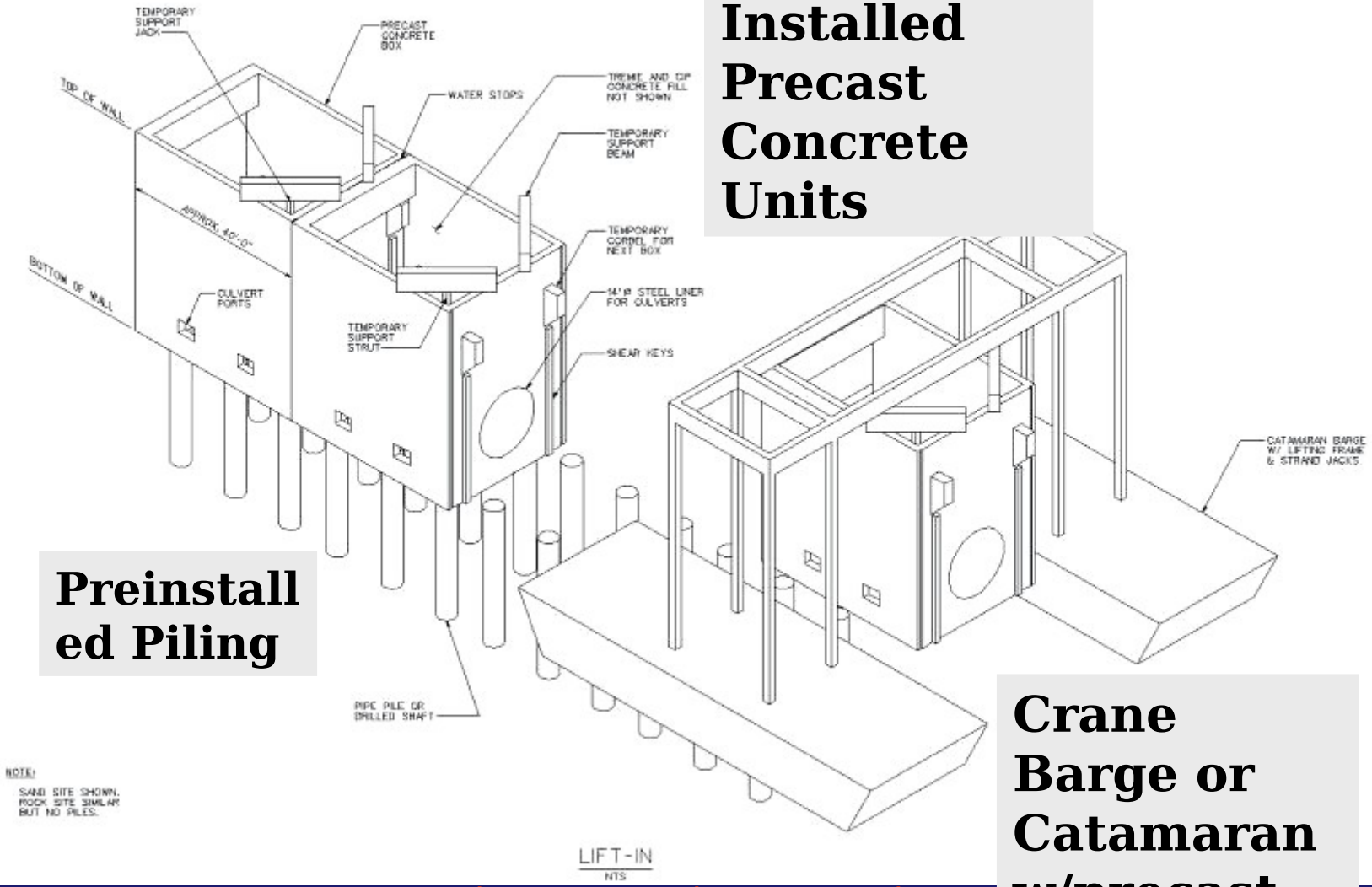

Installed Precast Concrete Units

Preinstalled Piling

Crane Barge or Catamaran w/precast

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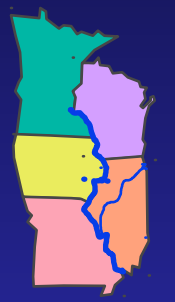
Closing Remarks



1. **Process & standardization reducing tomorrow's problems.**
   - **Decision tools – facilitates discussion, broadens input, identifies key areas/elements**
   - **Repetition of methods and ideas**
2. **Lessons Sought and Lessons Learned.**
   - **Seek learning – Develop and maintain a network, CoPs, advisory role of ITR, workshops**
3. **Document for <u>Your Successor.</u>**
   - **Successorship is a key problem –**

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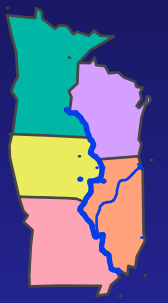

QUESTIONS ?